

Special Session XIV

Special Session Basic Information:

专栏题目 Session Title

中文：动态与不确定环境下具有弹性与自适应能力的微电网的人工智能应用
英文：Artificial Intelligence for Resilient and Self-Adaptive Microgrid Systems under Dynamic and Uncertain Environments

专栏介绍和征稿主题 Introduction and topics

中文：在高比例可再生能源接入和气候变化背景下，微电网运行环境呈现出显著的动态性、不确定性与复杂性。极端气象事件、可再生能源出力波动、负荷快速变化以及运行模式频繁切换，对微电网的安全性、可靠性和韧性提出了更高要求。传统基于静态模型或确定性假设的方法难以有效应对上述挑战。人工智能技术在环境感知、状态识别、动态预测、自适应决策与在线学习等方面展现出独特优势，为构建具备自适应能力和韧性的微电网系统提供了新的技术路径。本专栏聚焦动态与不确定环境下微电网的人工智能方法，重点关注面向复杂天气、扰动冲击和运行不确定性的自适应运行、预测感知与智能决策机制，推动微电网系统向高韧性、自主化和智能化方向发展。

征稿主题，包括但不限于

1. 动态与不确定环境下微电网的人工智能建模与状态感知
2. 面向极端与复杂气象条件的微电网预测方法
3. 微电网在随机扰动和突发事件下的韧性评估与增强策略
4. 基于人工智能的微电网自适应运行与在线决策方法
5. 强化学习、在线学习在微电网动态调度与控制中的应用
6. 多时间尺度下微电网的自适应能量管理与协调控制
7. 微电网并网/孤岛切换过程中的智能决策与安全运行
8. 人工智能驱动的微电网韧性运行示范与工程应用案例

英文：With the increasing penetration of renewable energy resources and the growing impact of climate variability, microgrid systems are operating under highly dynamic and uncertain environments. Extreme weather events, stochastic renewable generation, rapid load fluctuations, and frequent transitions between grid-connected and islanded modes pose significant challenges to the security, reliability, and resilience of microgrids. Conventional methods based on static models and deterministic assumptions are often insufficient to address these challenges. Artificial intelligence offers powerful capabilities in environmental perception, dynamic forecasting, adaptive decision-making, and online learning, enabling the development of resilient and self-adaptive microgrid systems. This special session focuses on AI-driven methodologies and applications for microgrids operating under dynamic and uncertain conditions, with particular emphasis on weather-aware prediction, adaptive operation, and resilience-oriented decision-making. The session aims to present recent advances that support the evolution of microgrids toward autonomous, resilient, and intelligent energy systems.

Topics of Interest include, but are not limited to)

1. AI-based modeling and state awareness of microgrids under dynamic and uncertain environments
2. Weather-aware and uncertainty-informed forecasting for microgrid operation
3. Resilience assessment and enhancement of microgrids under extreme events and disturbances
4. Artificial intelligence-enabled self-adaptive operation and online decision-making for microgrids
5. Applications of reinforcement learning and online learning in dynamic microgrid scheduling and control
6. Multi-timescale adaptive energy management and coordinated control of microgrids
7. Intelligent decision-making for secure grid-connected and islanded microgrid operation
8. Demonstration projects and practical case studies of resilient, AI-driven microgrid systems

Special Session Chair(s):

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Organizer's Brief Biography

中文：英国杜伦大学博士，英国 Exeter 大学博士后，同济大学博士后，上海市海外高层次人才，长期致力于人工智能与智能电网交叉领域研究，以第一/通讯作者发表 SCI/EI 论文 20 余篇，包括 IEEE TSG、TSE、TII、TIM、TAI 等 Trans.系列期刊 7 篇，担任 Nature Energy 及 Trans 期刊审稿人，EI 期刊青年编委，IEEE PES 会议宣传主席等，并作学术报告，主持包括上海市科委、教委等资助 AI 赋能项目近十项。

英文：He received his Ph.D. degree from Durham University, UK, and subsequently conducted postdoctoral research at the University of Exeter, UK, and Tongji University, China. He is a recipient of the Shanghai Overseas High-Level Talent Program. His research interests lie at the intersection of artificial intelligence and smart grids. As the first or corresponding author, he has published more than 20 SCI/EI-indexed journal papers, including seven articles in IEEE Transactions journals such as TSG, TSE, TII, TIM, and TAI. He serves as a reviewer for Nature Energy and multiple IEEE Transactions journals, and as a Young Editorial Board Member of an EI-indexed journal. He has also served as Publicity Chair for IEEE PES conferences and delivered invited academic talks. He has led nearly ten AI-empowered research projects funded by the Shanghai Municipal Science and Technology Commission and the Shanghai Municipal Education Commission, among others.

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Organizer's Brief Biography

中文：讲师，硕士生导师，担任电力碳减排研究所所长、电力工程系副主任、全国重点实验室助理。以第一/通讯作者发表 SCI/EI 论文二十余篇，其中 1 篇入选 ESI 高被引论文，2 篇入选 F5000 学术论文，4 篇入选知网高被引论文。主持河北省青年拔尖人才项目、智能 2030 项目子课题等横纵向项目 8 项。

英文：Lecturer and Master Supervisor. Currently, he serves as the Director of the Institute of Electric Power Carbon Emission Reduction, Deputy Head of the Department of Electrical Engineering, and Assistant to the Director of the State Key Laboratory.

He has published over 20 SCI/EI-indexed papers as the first or corresponding author, including one ESI Highly Cited Paper, two Front-runner 5000 (F5000) papers, and four CNKI Highly Cited Papers. He has spearheaded 8 research

projects, including the Hebei Provincial Project for Top-notch Young Talents and a sub-project of the "Intelligence 2030" National Major Program, encompassing both government-funded and industry-sponsored initiatives.



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Organizer's Brief Biography

中文：牛哲文，华南理工大学博士，加拿大阿尔伯塔大学访问学者，太原理工大学电气与动力工程学院电气系系主任，IEEEPCCC 会议委员会常务理事。主要研究方向为新能源发电预测、电力系统运行安全与控制、人工智能在电力系统中的应用等。主持国家自然科学基金、山西省自然科学基金青年基金、教育部重点实验室开放基金等纵向项目 6 项。以第一作者/通讯作者发表 SCI/EI 论文 20 余篇，授权发明专利 4 项，出版专著 1 部。

英文：ZHEWEN NIU received his Ph.D. degree from South China University of Technology, Guangzhou, China in 2021. In 2019, he was a visiting scholar at the Department of Electrical and Computer Engineering, University of Alberta, Alberta, Canada, supported by the China Scholarship Council (CSC). He is currently an Associate Department Head of the Electrical Engineering Department, College of Electrical and Power Engineering, Taiyuan University of Technology. He is a standing committee member of the IEEE PCCC Conference Committee, a member of the IEEE PES Taiyuan Chapter, and a reviewer for international journals such as Applied Energy and IEEE Transactions on Sustainable Energy. His main research interests include renewable energy generation forecasting, power system operational safety and control, and the application of artificial intelligence in power systems. He has presided over six research projects, including those from the National Natural Science Foundation of China, the Shanxi Provincial Natural Science Foundation for Young Scholars, and the Open Fund of the Ministry of Education Key Laboratory. He has authored or co-authored over 20 SCI/EI papers as first or corresponding author, holds four authorized invention patents, and has published one monograph.